

DECAY OF LANNATE (METHOMYL) RESIDUE  
ON SWEET CORN LEAVES IN RIVERSIDE COUNTY,  
CALIFORNIA, MAY 1976

HS-337 December 10, 1976

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INTRODUCTION

Methomyl is a highly toxic carbamate insecticide. It is used for broad-spectrum control of insects in many vegetable and field crops and certain fruit crops and ornamentals. Methomyl is applied primarily to lettuce, tomatoes, and sugarbeets; there were 19,210 pounds of methomyl reported as applied to over 48,218 acres of corn in 1975 in California.

The acute oral LD<sub>50</sub> (male, rat) for methomyl is 17 mg/kg. The dermal LD<sub>50</sub> is greater than 5000 mg/kg.

Formulations of methomyl (Lannate and Nudrin) include a 90% water soluble powder and a liquid concentrate containing 1.8 pounds active ingredient per gallon. Label directions for Lannate require dosage rates of 1 to 2 pints water soluble liquid per acre of corn with a preharvest interval of 0 days for the ears and 3 days for forage. Label directions for the water soluble powder recommend rates of 1/4 to 1/2 pounds per acre with the same preharvest interval. Tolerances for methomyl are 10 ppm in forage and fodder and 0.1 ppm in fresh grain. A safety interval had not been set for corn when this study was conducted.

APPLICATION AND SAMPLING

Methomyl decay on two sweet corn fields in Riverside County, California, was studied beginning 7-9 days prior to harvest. The first application on Field 1 was made May 14 with Lannate L and Lannate 90WP using 1/3 pound active ingredients per acre. The control sample was taken on May 17, finding trace amounts of methomyl. Field 1 was treated a second time with the same amount of pesticide by ground rig on May 18. One-third pound of actual methomyl was applied to Field 2 on May 20 by ground rig.

A single sample of sweet corn leaves was taken from Field 1 at intervals of 5 and 24 hours after application. Triplicate samples were taken thereafter for 9 days. Triplicate samples were collected from Field 2 about 18 hours and 4 days after application. Each sample consisted of about 100 leaf discs, 2.5 cm in diameter. Two of them were used for dislodgeable and penetrated residue analysis and the remaining one for total residue analysis.

### ANALYTICAL PROCEDURES (Extraction)

The procedure used for the extraction of dislodgeable, penetrated, and total residues from leaf punches was originally published by Gunther in "The Bulletin of Environmental Contamination and Toxicology," 9 243-249, 1973.

The sample container and leaf punches are weighed and the gross weight recorded.

#### Dislodgeable Residue

1. Fifty mls of water and approximately 4 drops of Sur-Ten solution (1:50) is added to the sample containers. The containers are capped and placed in a multi-purpose rotator and rotated at 30 cycles/min. for 60 min. The aqueous solution is decanted through a glass wool plug into a 500 ml separatory funnel.
2. The punches are rotated a second time, using 50 mls of water and 4 drops of Sur-Ten solution, for 30 min. This is added to the first extraction.
3. The sample is then hand-shaken for approximately 10 secs with 30 mls of water. The container is drained into the separatory funnel with the first two extractions.
4. The aqueous solution is extracted three times with 50 ml of ethyl acetate. The extract is filtered through sodium sulfate into a glass stoppered mixing cylinder and the volume is recorded. The extract is mixed in the cylinder. An aliquot is decanted into a teflon-capped bottle and stored in a freezer prior to cleanup and analysis.

#### Penetrated Residue

1. After the last water rinse is drained for the dislodgeable residue, the punches are transferred to a blender jar. The empty sample container is weighed and the net weight of the punches recorded.
2. Approximately 50 gms of sodium sulfate and 100 mls of ethyl acetate are added.
3. The sample is blended at high speed for 3 minutes, keeping the blender cup cool by immersing it in a container of cool water. The blender cup is removed and the sample allowed to settle.
4. An aliquot is decanted into a teflon-capped bottle and stored in a freezer prior to cleanup and analysis.

#### Total Residue

1. The leaf punches are transferred to a blending jar. The empty sample container is again weighed and the net weight of the punches recorded.
2. Approximately 50 gms of sodium sulfate and 100 mls of ethyl acetate are added.
3. The sample is blended at high speed for 3 minutes, keeping the blender cup cool by immersing it in a container of cool water. The blender cup is removed and the sample allowed to settle.

4. An aliquot is decanted into a refflon-capped bottle and stored in a freezer prior to cleanup and analysis.

#### Analytical Procedures (Clean-up)

Transfer sample to a 250 ml separatory funnel. Rinse the flask with 50 ml 0.01 N  $H_2SO_4$  and add to separatory funnel. Rinse the flask with 50 ml water and add to funnel. Agitate gently for one minute. Vigorous agitation will cause emulsions. Insufficient agitation will result in low recoveries. After phase separation, discard the ethyl acetate. Repeat the ethyl acetate partitioning if necessary. Multiple extractions will not depress recoveries. Extract the aqueous layer 3 x 50 with  $CH_2Cl_2$ , drying each extract with sodium sulfate.

#### Analytical Procedures (Chromatography)

For liquid-chromatographic determination, concentrate to an appropriate volume and inject.

##### LC Conditions:

Chromatronix 3500, Schoeffel detector at 233 nm  
Partisil 10 micron column 25 cm long  
6% MeOH in ethyl ether at 2 ml/min

##### Retention time:

Lannate 5 min  
100 ng gives about 50% deflection at 0.01 AUFS

#### RESULTS

Daily weather observations, made in Indio over the study period, are given in Table 1. The average daily minimum and maximum temperatures were 71.7°F and 100.4°F, respectively. No precipitation occurred during the study period.

Data on dislodgeable, penetrated and total residues are given in Table 2 and Figures 1, 1a and 2. Values for duplicate samples of dislodgeable and surface residues have been averaged in the graph. Penetrated residues of Field 1 decreased rapidly (below 2 ppm) within 3 days. Surface residues decreased a little slower and did not go below 1 ppm during the study. The residues on Field 2 seemed to degrade much faster than those on Field 1. Further study on the degradation of Lannate is needed.

TABLE 1: DAILY TEMPERATURE AND PRECIPITATION

Observations made for Indio, Riverside County, California

<u>DATE</u> (1976)	<u>TEMPERATURE (°F)</u>	
	Maximum	Minimum
5/14	104	68
5/15	108	74
5/16	105	76
5/17	97	68
5/18	100	77
5/19	101	73
5/20	98	65
Average	<u>100.4</u>	<u>71.7</u>

There was no precipitation during the study period.

TABLE 2: LANNATE RESIDUE ON SWEET CORN LEAVES - MAY 1976

Field 1 -

Sample No.	Date (1976)	Sample Interval	LANNATE RESIDUE (PPM)		
			Surface Residue	Penetrated Residue	Total Residue
NL 1	5-17	Control	<0.7	<0.14	
NL 2	5-18	5 hrs.	8.0	5.3	
NL 5	5-19	24 hrs.	13.5	4.0	
NL 10A	5-20	2 days	9.6	1.7	
NL 10B	5-20	2 days	10.9	1.9	
NL 10C	5-20	2 days			11.8
NL 14A	5-21	3 days	8.5	2.0	
NL 14B	5-21	3 days	9.5	1.9	
NL 14C	5-21	3 days			9.0
JM 1A	5-25	7 days	2.8	0.0	
JM 1B	5-25	7 days	1.0	0.0	
JM 1C	5-25	7 days			0.8
JM 8A	5-27	9 days	4.3	0.5	
JM 8B	5-27	9 days	4.7	0.6	
JM 8C	5-27	9 days			3.3

Field 2 -

Sample No.	Date (1976)	Sample Interval	LANNATE RESIDUE (PPM)		
			Surface Residue	Penetrated Residue	Total Residue
NL 13A	5-21	18 hrs.	53.2	27.9	
NL 13B	5-21	18 hrs.	51.0	27.2	
NL 13C	5-21	18 hrs.			76.7
JM 3A	5-25	4 days	9.9	0.0	
JM 3B	5-25	4 days	3.3	0.0	
JM 3C	5-25	4 days			4.6

**FIGURE 1: LANNATE RESIDUE ON SWEET CORN LEAVES IN FIELD 1  
RIVERSIDE COUNTY, CALIFORNIA. MAY 1976**

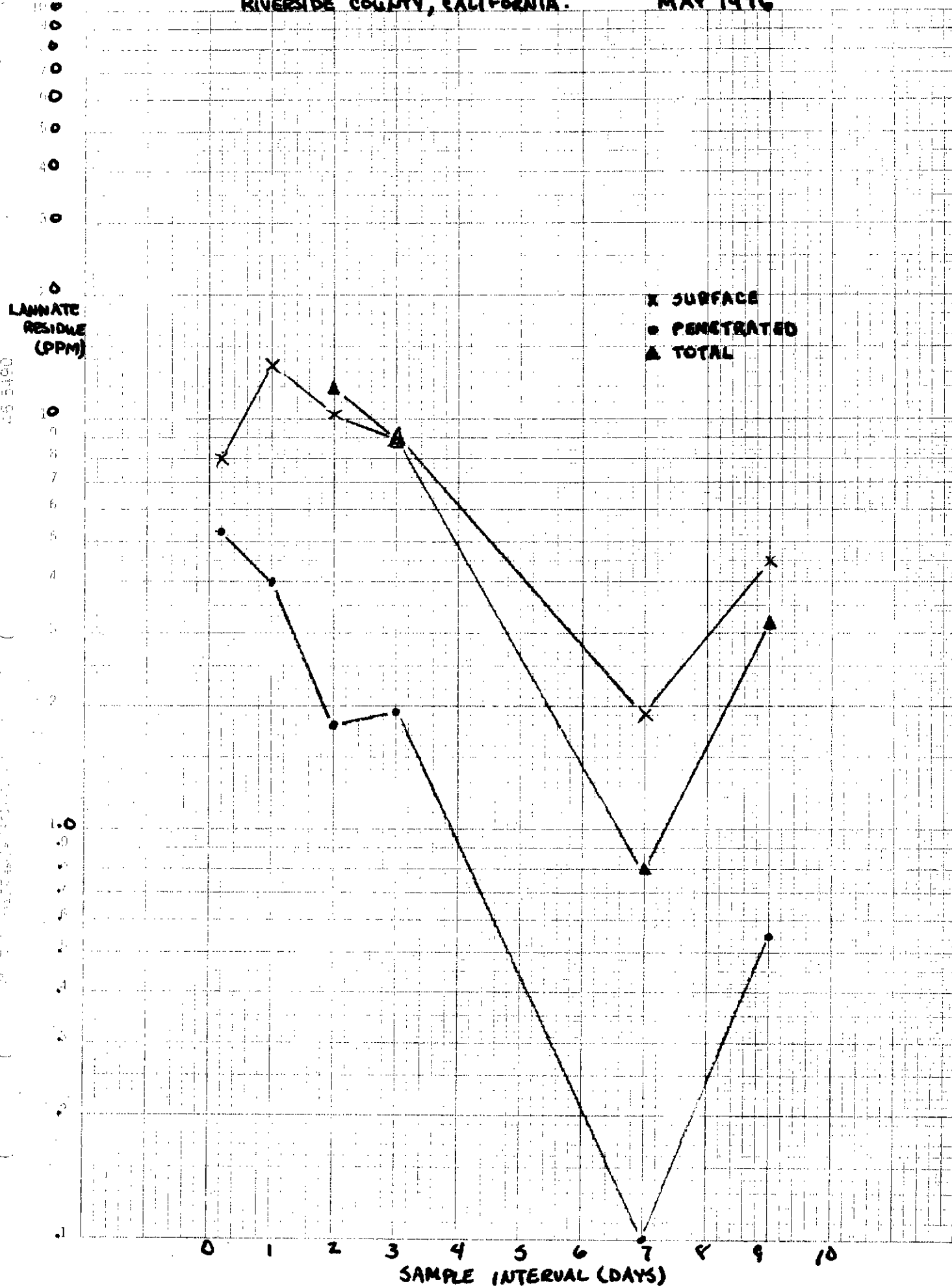


FIGURE 12: LANNATE RESIDUE ON SWEET CORN LEAVES IN FIELD 1  
RIVERSIDE COUNTY, CALIFORNIA. MAY 1976

LANNATE  
RESIDUE  
(PPM)

---X SURFACE  
---• PENETRATED  
---▲ TOTAL

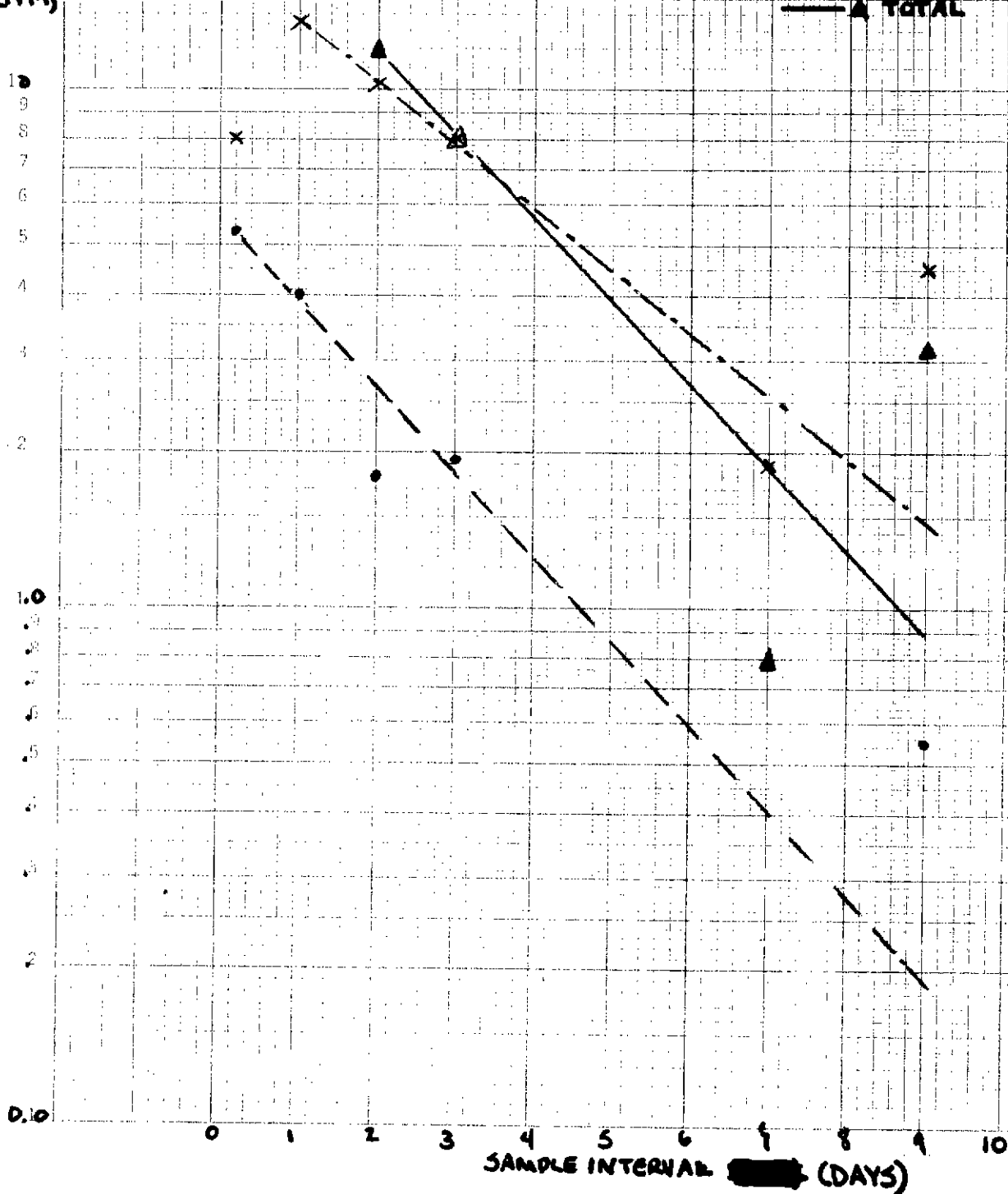
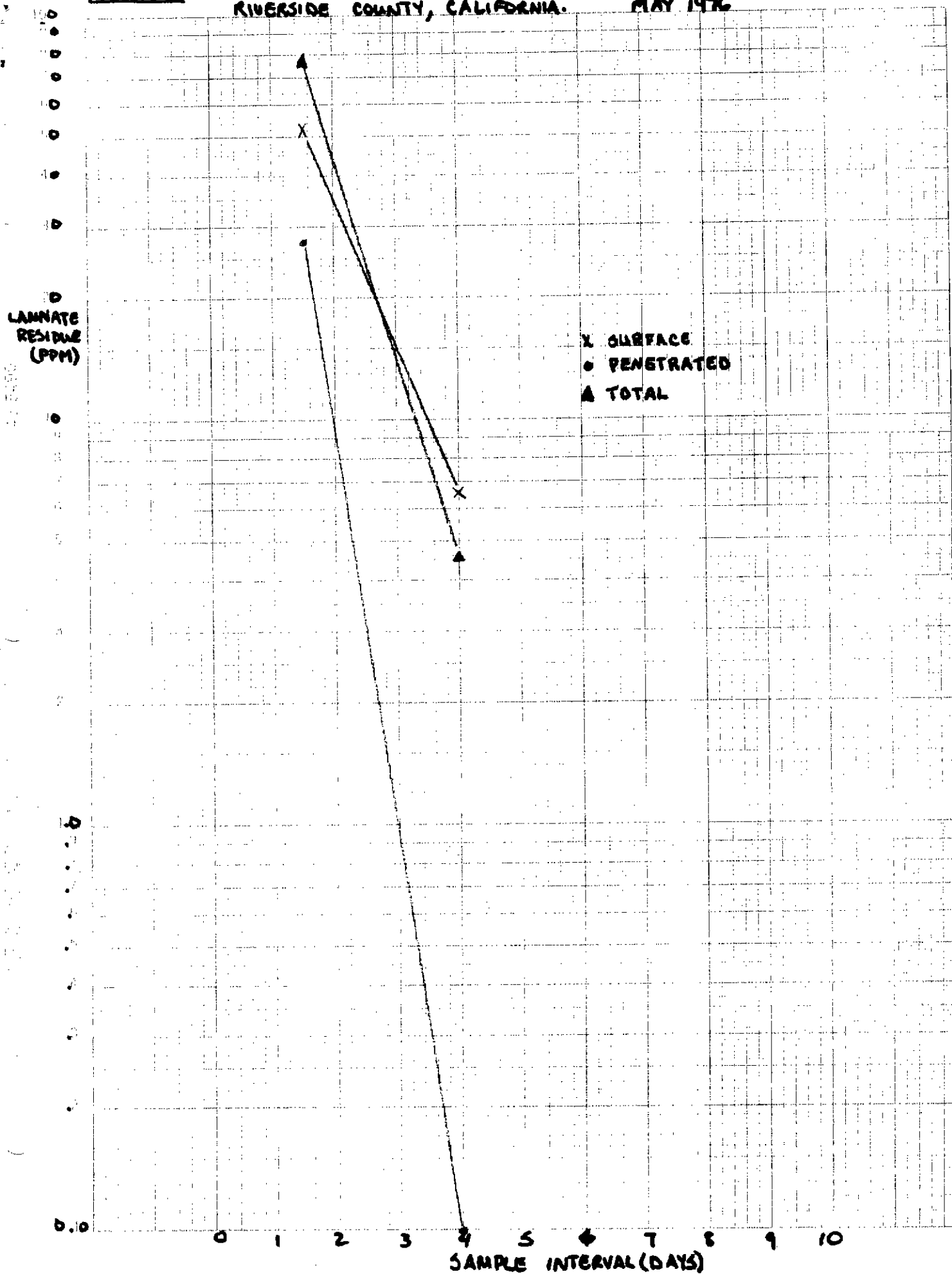




FIGURE 2: LANNATE RESIDUE ON SWEET CORN IN FIELD 2  
RIVERSIDE COUNTY, CALIFORNIA. MAY 1976



Addendum to HS-337  
Recalculation of Dislodgeable Residues

Results of Analysis of Sweet Corn Foliage for  
Dislodgeable Residues of Methomyl

Sample Interval	Residue (ug/cm2)
=====	
Pre-app	ND
6 hrs.	.056
1 day	.148
2 days	.103
2 days	.111

ND - none detected

Results of Analysis of Sweet Corn Foliage for  
Dislodgeable Residues of Methomyl (Field 2)

Sample Interval	Residue (ug/cm2)
=====	
18 hrs.	.637 .703
4 days	.023 .006